What is claimed is:

1. A method comprising:

a pre-distortion of a signal which will be subjected to a non-linear channel wherein the signal will be distorted by the non-linear characteristic of the channel and the pre-distortion will induce the opposite distortion to that of the channel;

a method wherein the signal will be converted from a complex I and Q baseband signal to a digital IF composite real signal and the AM/AM and AM/PM pre-distortion is performed on the real composite signal;.

a method wherein the pre-distorted signal is converted back to a complex I and Q form and the I and Q channels are individually converted to a baseband analog form and then the compound real signal is created at RF after the complex up conversion to RF;

a method wherein the post amplified signal is sampled and is compared to the non-pre-distorted compound real signal to determine the error in the AM/AM and AM/PM pre-distortion algorithm;

a method wherein the non-linear pre-distortion algorithm is updated with the data from the comparison of the pre-distorted post amplified signal and the non-pre-distorted signals;

a method wherein the AM/AM and AM/PM pre-distortion LUTs are dual memories wherein one is updated while the other is used and then they are switched in one symbol time so no data is lost in the algorithm update process;

a method where in the AM/PM pre distortion is done digitally;

a method where in the AM/PM pre-distortion is done via an analog technique;

a method wherein the non-linear pre-distortion algorithm is computed by computing a

series model of the non-linear channel by computing a series from the sampled values of the post amplified pre-distorted signal;

2. The method defined in claim 1, wherein the I digital channel signal is multiplied by a digital cosine signal and converted to a digital IF;

3. The method defined in claim 1, wherein the Q digital channel signal is multiplied by a digital sine signal and converted to a digital IF

4. The method defined in claim 1, wherein the digital IF I channel is added to the digital IF Q channel to create a digital IF real compound signal.

5. The method defined in claim 1, wherein the digital IF real compound signal is over written on a small number of uniformly or non-uniformly spaced samples with a Barker type of sequence with high autocorrelation properties to facilitate the time offset calibration between the post amplified pre-distorted signal and the non-pre-distorted signal.

6. The method defined in claim 1, wherein the over writing of samples with a Barker type of sequence is reduced or eliminated after the time offset correlation has been established and then the offset is the updated via correlation of just signal sample values.

7. The method defined in claim 1, wherein copies of the samples of the signal to be pre-distorted are sent to two sets of LUTs, one for the AM/AM and one for the AM/PM.

8. The method defined in claim 1, wherein the stored values in the AM/AM pre-distortion table are addressed by the non-pre-distorted samples and the values stored in the AM/AM table are the values of the pre-distorted signal compensating for the anticipated AM/AM in the amplification chain.

9. The method defined in claim 1, wherein the values stored in the AM/AM predistortion

table are limited such that no value output from the memory will allow signal clipping in the amplifier chain. This minimizes sidelobe regrowth and out of band emissions.

10. The method defined in claim 1, wherein the output values of the AM/AM pre-distortion LUT are digitally phase shifted to induce the opposite AM/PM distortion such that the output of the amplifier is near distortion free.

11. A method defined in claim 1, wherein the pre-distorted compound real signal at a low IF is de-composed into I and Q baseband or digital zero IF by a digital complex down conversion prior to the conversion to analog baseband I and Q for complex up conversion to RF.

12. A method defined in claim 1, wherein the pre-distorted analog I and Q signals are used to create a compound real signal at RF for final amplification via a pre-amplifier and/or the HPA.

13. A Method defined in claim 1, wherein the output of the HPA is sampled via an RF coupler and the sampled value is down converted in frequency and sampled with a A/D converter to create a sample set to be compared to the ideal non-pre-distorted signal for determination of the error in the pre-distortion function to support the update of the pre-distortion function.

14. A method defined in claim 1, wherein the non-pre-distorted signal is sampled and a snap shot taken which is then correlated in time with the RF sampled value and the timing offset is determined.

15. A Method defined in claim 1, wherein the non-pre-distorted signal values of a given set of samples is compared to the post amplified pre-distorted signal to determine the error is the AM/AM and AM/PM correction.

16. A method defined in claim 1, wherein the errors in the AM/AM and AM/PM are used to

generate 3rd or 5th or 7th or higher order curve fits to predict the time and temperature dependent AM/AM and AM/PM correction.

17. A method defined in claim 1, wherein the calculated curves for the AM/AM and AM/PM are used to compute the new updated values for the AM/AM and AM/PM LUTs and the standby LUTs are updated and switched in, within one sample time, to prevent loss of date during the update process. This provides for continual calibration of the pre-distortion process over time and temperature.

18. A method defined in claim 1, wherein the size of the LUTs is kept to a minimum because the size of LUT is limited by the addressed registers which is equal to the number of bits in the composite real signal at the digital IF.

19. A method defined in claim 1, wherein the pre-distortion algorithm is updated by generating a series representation of the residual nonlinear channel distortions with a Voltera or Taylor series of like mathematical expression generated from the sampled post amplified signal.

20. A method defined in claim 1, wherein the I and Q signals are use to create a composite real signal as a digital IF where the pre-distortion is preformed and the composite signal is decomposed back to I and Q after pre-distortion and then converted to analog signals and converted to the composite real signal at RF via a complex up conversion.

21. An apparatus comprising:

a pre-distortion of a signal which will be subjected to a non-linear channel wherein the signal will be distorted by the non-linear characteristic of the channel and the pre-distortion will induce the opposite distortion to that of the channel;

a method wherein the signal will be converted from a complex I and Q baseband signal

to a digital IF composite real signal and the AM/AM and AM/PM pre-distortion is performed on the real composite signal;.

a method wherein the pre-distorted signal is converted back to a complex I and Q form and the I and Q channels are individually converted to a baseband analog form and then the compound real signal is created at RF after the complex up conversion to RF;

a method wherein the post amplified signal is sampled and is compared to the non-pre-distorted compound real signal to determine the error in the AM/AM and AM/PM pre-distortion algorithm;

a method wherein the non-linear pre-distortion algorithm is updated with the data from the comparison of the pre-distorted post amplified signal and the non-pre-distorted signals;

a method wherein the AM/AM and AM/PM pre-distortion LUTs are dual memories wherein one is updated while the other is used and then they are switched in one symbol time so no data is lost in the algorithm update process;

a method where in the AM/PM pre distortion is done digitally;

a method where in the AM/PM pre-distortion is done via an analog technique;

a method wherein the non-linear pre-distortion algorithm is computed by computing a series model of the non-linear channel by computing a series from the sampled values of the post amplified pre-distorted signal;

22. The apparatus defined in claim 21, wherein the I digital channel signal is multiplied by a digital cosine signal and converted to a digital IF;

23. The apparatus defined in claim 21, wherein the Q digital channel signal is multiplied by a digital sine signal and converted to a digital IF

24. The apparatus defined in claim 21, wherein the digital IF I channel is added to the digital IF Q channel to create a digital IF real compound signal.

25. The apparatus defined in claim 21, wherein the digital IF real compound signal is over written on a small number of uniformly spaced samples with a Barker type of sequence with high autocorrelation properties to facilitate the time offset calibration between the post amplified pre-distorted signal and the non-pre-distorted signal.

26. The apparatus defined in claim 21, wherein the over writing of samples with a Barker type of sequence is reduced or eliminated after the time offset correlation has been established and then the offset is the updated via correlation of just signal sample values.

27. The apparatus defined in claim 21, wherein copies of the samples of the signal to be pre-distorted at sent to two sets of LUTs, one for the AM/AM and one for the AM/PM.

28. The apparatus defined in claim 21, wherein the stored values in the AM/AM pre-distortion table are addressed by the non-pre-distorted samples and the values stored in the AM/AM table are the values of the pre-distorted signal compensating for the anticipated AM/AM in the amplification chain.

29. The apparatus defined in claim 21, wherein the values stored in the AM/AM predistortion table are limited such that no value output from the memory will allow signal clipping in the amplifier chain. This minimizes sidelobe regrowth and out of band emissions.

30. The apparatus defined in claim 21, wherein the output values of the AM/AM pre-distortion LUT are digitally phase shifted to induce the opposite AM/PM distortion such that the output of the amplifier is near distortion free.

31. The apparatus defined in claim 21, wherein the pre-distorted compound real signal at a

low IF is de-composed into I and Q baseband or digital zero IF by a digital complex down conversion prior to the conversion to analog baseband I and Q for complex up conversion to RF.

32. The apparatus defined in claim 21, wherein the pre-distorted analog I and Q signals are used to create a compound real signal at RF for final amplification via a pre-amplifier and the HPA.

33. The apparatus defined in claim 21, wherein the output of the HPA is sampled via an RF coupler and the sampled value is down converted in frequency and sampled with a A/D converter to create a sample set to be compared to the ideal non-pre-distorted signal for determination of the error in the pre-distortion function to support the update of the pre-distortion function.

34. The apparatus defined in claim 21, wherein the non-pre-distorted signal is sampled and a snap shot taken which is then correlated in time with the RF sampled value and the timing offset is determined.

35. The apparatus defined in claim 21, wherein the non-pre-distorted signal values of a given set of samples is compared to the post amplified pre-distorted signal to determine the error is the AM/AM and AM/PM correction.

36. The apparatus defined in claim 21, wherein the errors in the AM/AM and AM/PM are used to generate 3rd or 5th or 7th or higher order curve fits to predict the time and temperature dependent AM/AM and AM/PM correction.

37. The apparatus defined in claim 21, wherein the calculated curves for the AM/AM and AM/PM are used to compute the new updated values for the AM/AM and AM/PM LUTs and the standby LUTs are updated and switched in, within one sample time, to prevent loss of date

during the update process. This provides for continual calibration of the pre-distortion process over time and temperature.

38. The apparatus defined in claim 21, wherein the size of the LUTs is kept to a minimum because the size of LUT is limited by the addressed registers which is equal to the number of bits in the composite real signal at the digital IF.

39. The apparatus defined in claim 21, wherein the pre-distortion algorithm is updated by generating a series representation of the residual nonlinear channel distortions with a Voltera or Taylor series of like mathematical expression generated from the sampled post amplified signal.

40. The apparatus defined in claim 21, wherein the I and Q signals are use to create a composite real signal as a digital IF where the pre-distortion is preformed and the composite signal is decomposed back to I and Q after pre-distortion and then converted to analog signals and converted to the composite real signal at RF via a complex Upconversion.